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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/772,762	02/04/2004	Kevin L. Gering	B-247	5690

7590 03/21/2006

EXAMINER	
BOTTORFF, CHRISTOPHER	
ART UNIT	**PAPER NUMBER**
3618	

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DATE MAILED: 03/21/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/772,762	GERING ET AL.	
	Examiner	Art Unit	
	Christopher Bottorff	3618	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 February 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-38* is/are pending in the application.

4a) Of the above claim(s) *34-38* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-10,16-29 and 31-33* is/are rejected.

7)☒ Claim(s) *11-15 and 30* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *04 February 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *2/4/2004*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

Applicant's election without traverse of invention I, drawn to the thermal management system of claims 1-33, in the reply filed on February 27, 2006 is acknowledged.

Claims 34-38 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim.

Information Disclosure Statement

The information disclosure statement (IDS) submitted on February 4, 2004 was considered by the examiner.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-10, 16, 18-29, and 31-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brinkmann et al. US 4,007,315 in view of Matsuda et al. US 6,357,541 and Goswami et al. US 5,687,706.

Brinkmann et al. disclose a thermal management system comprising first and second coolant loops that are each thermally coupled to a heat exchanger 50. The first loop is depicted in the upper portion of Figure 12 above heat exchanger 50 and the second loop is depicted in the lower portion of Figure 12 below heat exchanger 50. The first coolant loop is also thermally coupled to a battery type electro-chemical storage device 30 located within the first coolant loop, and the first and second loops are configured to carry distinct thermal energy transfer media. See column 12, lines 19-23; column 11, lines 52-61; and column 12, lines 5-13. In particular, the first coolant loop has a first water coolant mixture flowing therein and the second loop has a second expandable/compressible coolant mixture flowing therein. See column 12, lines 5-13. The heat exchanger 50 is configured such that it is capable of allowing only flow of the first coolant mixture within the heat exchanger. See column 11, lines 30-36. An interface, at second heat exchanger 38, is configured to facilitate transfer of heat generated by a heater 40 to the heat exchanger 50 via the second coolant loop in order to selectively deliver the heat to the electro-chemical storage device 30. See Figure 12 and column 9, lines 57-61.

The interface comprises a fluid supply path 39 in fluid communication with the second coolant loop. See Figure 12. The heat generated by the heater 40 is provided to the heat exchanger 50 via the fluid supply path 39 and the second coolant loop. See Figure 12. The fluid supply path 39 is thermally coupled to a radiator core of the vehicle at 35. See column 9, lines 57-61. The heat generated by the heater 40 is selectively delivered to heat exchanger 32 to heat a passenger cabin of the vehicle via the second

coolant loop, or delivered to the electro-chemical storage device 30 via the first coolant loop to increase a temperature of the electro-chemical storage device. See column 10, lines 56-66; column 8, lines 60-68; and column 9, lines 1-4.

The heat exchanger comprises a liquid-to-liquid heat exchanger. See column 12, lines 5-13. The heat exchanger 50 is configured to control heat supplied to components of the vehicle during select phases of vehicular operation including cold-start conditions, normal operating conditions, and hot-operating conditions. See column 8, lines 60-68; column 9, lines 1-4; column 10, lines 5-7, 28-30, 44-46, and 57-59; and column 11, lines 3-4 and 23-45. The heat exchanger 50 is configured to preheat the electro-chemical storage device 30 and a passenger cabin of the vehicle to enhance performance of the electro-chemical storage device and enhance cabin comfort of the passenger cabin. See column 10, lines 56-66; column 8, lines 60-68; and column 9, lines 1-4.

A heater, rather than an internal combustion engine, generates the heat transferred at the interface of Brinkmann et al. Also, Brinkmann et al. do not disclose that the heat exchanger has a thermal energy storage material provided therein.

However, Matsuda et al. teach the desirability of transferring heat generated by an internal combustion engine 3 to a battery 5 via a heat exchanger 11. See column 4, lines 20-22. From the teachings of Matsuda et al., generating the heat at the interface of Brinkmann et al. with an internal combustion engine rather than a heater would have been obvious to one of ordinary skill in the art at the time the invention was made. This would conserve electrical power in the vehicle and efficiently utilize the waste heat of an engine.

In addition, Goswami et al. teach the desirability of providing a thermal energy storage material 52 in a heat exchanger. See Figure 1. The thermal energy storage material 52 is a phase change material configured to change from a solid state to a liquid state and vice-versa during select conditions, and is encapsulated in spheres in a baffled framework within the heat exchanger. See column 1, lines 7-9; column 5, lines 1-5; column 1, lines 23-43; and Figure 2. From the teachings of Goswami et al., providing a thermal energy storage material in the form of a phase change material, in the heat exchanger of Brinkmann et al., would have been obvious to one of ordinary skill in the art at the time the invention was made. This would enhance the efficiency and effectiveness of the heat exchanger.

The system resulting from the combination of Brinkmann et al., Matsuda et al., and Goswami et al. would produce the claimed system. In particular, since the internal combustion engine provides heat to the second loop, the coolant flowing through the second loop would be used in association with the internal combustion engine. The heat exchanger 50 would be capable of storing the heat generated by the internal combustion engine and selectively providing the stored heat to various components of the vehicle. The heat generated by the internal combustion engine provided to the heat exchanger 50 would regenerate the thermal energy storage material, wherein regenerating the thermal energy storage material includes converting the thermal energy storage material from a solid state to a liquid state material. Upon providing the heat to the heat exchanger 50, a sensible heat as well as a latent heat of fusion of the thermal energy storage material would be increased from a thermal state to a higher

different thermal state. The heat generated by the internal combustion engine would be stored in the thermal energy storage material for use during cold-start conditions of the vehicle to increase a temperature of the electro-chemical storage device.

Claims 1, 16, and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brinkmann et al. US 4,007,315 in view of Matsuda et al. US 6,357,541, and James US 5,239,839.

Brinkmann et al. disclose a thermal management system comprising first and second coolant loops that are each thermally coupled to a heat exchanger 50. The first loop is depicted in the upper portion of Figure 12 above heat exchanger 50 and the second loop is depicted in the lower portion of Figure 12 below heat exchanger 50. The first coolant loop is also thermally coupled to a battery type electro-chemical storage device 30 located within the first coolant loop, and the first and second loops are configured to carry distinct thermal energy transfer media. See column 12, lines 19-23; column 11, lines 52-61; and column 12, lines 5-13. In particular, the first coolant loop has a first water coolant mixture flowing therein and the second loop has a second compressible/expandable coolant mixture flowing therein. See column 12, lines 5-13. An interface, at second heat exchanger 38, is configured to facilitate transfer of heat generated by a heater 40 to the heat exchanger 50 via the second coolant loop in order to selectively deliver the heat to the electro-chemical storage device 30. See Figure 12 and column 9, lines 57-61. Also, the heat exchanger 50 is a liquid-to-liquid heat exchanger. See column 12, lines 5-13.

A heater, rather than an internal combustion engine, generates the heat transferred at the interface of Brinkmann et al. Also, Brinkmann et al. do not disclose that the heat exchanger has a thermal energy storage material provided therein, or that the heat exchanger has fins.

However, Matsuda et al. teach the desirability of transferring heat generated by an internal combustion engine 3 to a battery 5 via a heat exchanger 11. See column 4, lines 20-22. From the teachings of Matsuda et al., generating the heat at the interface of Brinkmann et al. with an internal combustion engine rather than a heater would have been obvious to one of ordinary skill in the art at the time the invention was made. This would conserve electrical power in the vehicle and efficiently utilize the waste heat of an engine.

In addition, James teaches the desirability of providing a thermal energy storage material 3 in a heat exchanger with fins 6. See Figure 1 and column 5, lines 6-10. The thermal energy storage material 3 is encapsulated in one or more sections of flexible tubing 2 comprised in the heat exchanger. See Figure 1. Each tube 2 is in the shape of a cylindrical capsule and is flexible in that the tube may shrink or expand. See column 3, lines 4-16, and column 2, lines 60-65. This form of encapsulation will inherently reduce a ratio of encapsulant volume relative to volume of the thermal energy storage material. From the teachings of James, providing a thermal energy storage material in the form of a phase change material, in the heat exchanger of Brinkmann et al., would have been obvious to one of ordinary skill in the art at the time the invention was made. This would enhance the efficiency and effectiveness of the heat exchanger.

In the system produced by the combination of Brinkmann et al., Matsuda et al., and James, the heat exchange tubing would be configured to exchange heat between the thermal energy storage material and the respective thermal energy transfer media circulating in the first and second coolant loops, as required by claim 17.

Allowable Subject Matter

Claims 11-15 and 30 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Each of claims 11 and 30 require the second heat exchanger to be provided in the first coolant loop in which the electro-chemical storage device is located. The prior art, as exemplified by Brinkmann et al., provides the second heat exchanger in the second loop. Also, the prior art does not teach or suggest locating the second heat exchanger in the loop in which the electro-chemical storage device is located. Thus, this feature, in combination with the further limitations of the claims, distinguishes the claimed invention over the prior art.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Ambruster, Holthouse, Martin et al., Parenti, Jr. et al.,Galloway, Kothmann, Muso et al., Hasegawa et al., Dage et al., Hellmann et al., Brotz et al., and Hu disclose thermal management energy systems. Ruka et al. and Frisch et al.

disclose heat exchangers having thermal energy storage material provided therein. Ko et al., Fang et al., and Wurz et al. disclose heat exchangers with fins.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher Bottorff whose telephone number is (571) 272-6692. The examiner can normally be reached on Mon.-Fri. 7:30 a.m. - 4:00 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chris Ellis can be reached on (571) 272-6914. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Christopher Bottorff